

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	CALIBRATION AND ROUTINE MAINTENANCE OF CAMPBELL SCIENTIFIC CS105 BAROMETRIC PRESSURE SENSORS
TYPE	TECHNICAL INSTRUCTION
NUMBER	3150-2020
DATE	DECEMBER 1996

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	David D. Meisters	
PROJECT MANAGER	John F. Faust	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

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1.0 PURPOSE AND APPLICABILITY

The purpose of calibration and maintenance is to assure quality data capture and minimize data loss by performing and documenting scheduled operational checks and preventive maintenance. This technical instruction (TI) provides specific details for routine calibration and maintenance of Campbell Scientific CS105 barometric pressure sensors. The sensor uses Vaisala's Barocap® silicon capacitive pressure sensor, which is designed for accurate and stable measurement of barometric pressure.

Experienced technicians using this TI, Standard Operating Procedure (SOP) 3150, *Calibration and Routine Maintenance of Meteorological Monitoring Systems*, and the manufacture's instrument manual should be able to adjust the equipment to fully meet all defined specifications.

Calibrations are required under any of the following circumstances:

- Upon acceptance testing of a new instrument
- Upon installation or removal of the instrument at a field station
- Whenever control limits are exceeded
- Prior to any corrective action, service, or maintenance to any portion of the instrument that affects its operational principle
- At a maximum interval of 6 months

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall:

- Establish the project-specific calibration and maintenance schedule and coordinate with the client as necessary.
- Establish the calibration reporting protocol to satisfy client requirements.
- Review calibration results.
- Identify inconsistencies in calibration results and initiate corrective action as required.
- Review and approve any changes to calibration procedures.

2.2 FIELD SPECIALIST

The field specialist shall:

- Perform required calibrations and maintenance as described in this TI.
- Document all calibration results and maintenance procedures performed.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The following equipment and materials are required for barometric pressure sensor calibration:

- Digital voltmeter (4-1/2 digit)
- Calibrated hand-held barometer
- Campbell Scientific instrument manual
- Field service tools
- Station log book
- Calibration forms
- Pen or pencil
- Laptop computer loaded with Excel workbook (NPS.XLT) and CALCU program software
- ARS calibration stickers

4.0 METHODS

The barometric system must be dynamically checked (pre-maintenance calibration) before any adjustments are made to the signal conditioning software instructions or before servicing the meteorological sensors. Throughout the calibration and maintenance period, the datalogger, calibration forms, and strip chart (if used) must be annotated to indicate that data taken during the calibration period should not be included as standard observations.

After performing system adjustments and maintenance, the system again needs to be dynamically checked (post-maintenance calibration) to ensure proper operation of the sensor. The pre- and post- maintenance calibration techniques are identical. Do not adjust the signal conditioning cards or perform any maintenance to the sensors until all pre-calibration checks are completed.

The procedures described in this TI are specific to Campbell Scientific CS105 barometric pressure sensors. Calibration and maintenance include tasks that are detailed in the following five (5) major subsections:

- 4.1 Calibration Checks
- 4.2 Sensor Adjustments
- 4.3 Sensor Maintenance
- 4.4 Post-Maintenance Calibration Checks
- 4.5 Documentation

4.1 CALIBRATION CHECKS

A complete calibration check must be performed prior to (pre) and following (post) any maintenance activity. The calibration check procedures described below apply to both pre- or post-maintenance calibration checks. Refer to Figure 4-1, Example Wetness, Precipitation, and Barometric Pressure Calibration Form, when performing calibration checks. Be sure to indicate on the form whether the calibration is pre- or post-maintenance and note all maintenance activities or replaced components in the “Comments” field. The form is available as an Excel spreadsheet and should be used for both pre- and post-maintenance checks. Results of each calibration should be in both hardcopy and digital form.

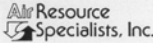
Calibration checks are performed semiannually. Should any operational check be out of suggested tolerance, complete the calibration check before any maintenance or adjustments are made. The following operational checks should be performed:

ANNOTATE DATA RECORDS	Make an entry in the station log book indicating the date and time (beginning and ending) of the calibration and maintenance procedures. “Down” the appropriate channels on the DAS or set the calibration flag as appropriate for the DAS being used.
	Complete the following fields on the calibration form: network and station name; current date; name of technician performing the calibration; manufacturer, model, and serial number of the instrument; and date of the last calibration.
RECORD READINGS	Simultaneously record the pre-maintenance DVM and DAS readings of the sensor to be calibrated.

4.2 SENSOR ADJUSTMENTS

A trimmer potentiometer is located under the plastic cover on the front panel for offset fine adjustment. This potentiometer can be used at any pressure level to make a maximum ± 1 hPa (mbar) offset adjustment to the barometer output.

Consult Campbell Scientific for further instructions if a larger offset or offset/gain adjustment is needed.

		WETNESS, PRECIPITATION AND BAROMETRIC PRESSURE CALIBRATION FORM		
Network:		Location:		Date:
				Date of Last Site Visit:
				Field Specialist:
Barometric Pressure Reference S/N: test				Calibration Date:
Precipitation Reference S/N: N/A		Calibration Volume: 936 ml		Calibration Date:

WETNESS				
SENSOR IDENTIFICATION				
	Pre-Maintenance	Post Maintenance		
Mfg.				
Model #				
Serial #				

PRE-MAINTENANCE SENSOR RESPONSE				
	DVM (volts)	DAS	LED (ON/OFF)	Pass/Fail
DRY			off	
WET			on	

POST MAINTENANCE SENSOR RESPONSE				
	DVM (volts)	DAS	LED (ON/OFF)	Pass/Fail
DRY			off	
WET			on	

Pre-Maint Wetness Comments:	
Post Maint Wetness Comments:	

PRECIPITATION									
SENSOR IDENTIFICATION									
	Pre-Maintenance				Post Maintenance				
Mfg.	Climatronics				Climatronics				
Model #	100508				100508				
Serial #									

PRE-MAINTENANCE					POST MAINTENANCE				
Cal Volume (ml)	Target # of Tips	# of Tips	% Difference	Pass/Fail	Cal Volume (ml)	Target # of Tips	# of Tips	% Difference	Pass/Fail
936	206				936	198			

Pre-Maint Precipitation Comments:	
Post Maint Precipitation Comments:	

BAROMETRIC PRESSURE									
SENSOR IDENTIFICATION									
	PRE-MAINTENANCE				POST MAINTENANCE				
Mfg.	Visalia				Visalia				
Model #	mm Hg				mm Hg				
Serial #									

SENSOR RESPONSE									
PRE-MAINTENANCE					POST MAINTENANCE				
Reference	DVM (Volts)	DAS (mm Hg)	Difference	Pass/Fail	Reference	DVM (Volts)	DAS (mm Hg)	Difference	Pass/Fail
Maximum:					Maximum:				

Pre-Maint Barometric Pressure Comments:	
Post Maint Barometric Pressure Comments:	

Figure 4-1. Example Wetness, Precipitation, and Barometric Pressure Calibration Form.

4.3 SENSOR MAINTENANCE

There are no user-serviceable parts on the CS105 barometric pressure sensor. The manufacturer recommends annual recalibration at the manufacturer's facility. An RMA number must be obtained from Campbell Scientific, telephone (801) 750-2342, before returning the sensor for recalibration.

4.4 POST-MAINTENANCE CALIBRATION CHECKS

After completing all maintenance and adjustment activities, initiate a post-maintenance calibration check as described in Section 4.1 and record them as the post-maintenance values.

4.5 DOCUMENTATION

Sensor calibrations require several levels of documentation:

CALIBRATION FORMS	Calibration forms or the computer laptop Excel spreadsheet should be completed entirely. Where possible, use the Excel spreadsheet so that both a hard copy and digital record of the calibration are maintained. Review and sign all calibration forms.
LOG NOTES	A summary of results and maintenance performed must be included in the station log notes. Note any abnormalities in sensor or calibration operation that could affect the quality of data.
CALIBRATION STICKER	An ARS calibration sticker is placed on the sensor, marking the date the instrument was calibrated and the name of the technician who calibrated it.



Figure 4-2. ARS Calibration Sticker.

TRIP REPORT	The calibration is thoroughly documented in a written site trip report.
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5.0 REFERENCES

Campbell Scientific, Inc., CS105 Barometric Pressure Sensor Instruction Manual. Logan, UT.